Name | Reg. No | Class

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4EX

BIOLOGY (with SPA)

5158/01

Paper 1 Multiple Choice [40 Marks]

PRELIMINARY EXAMINATION TWO

August 2017

1 hour

Additional Materials:
Approved calculator
Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS TO CANDIDATES:

Do not start reading the questions until you are told to do so.

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, class, and index number on the OTAS provided.

INFORMATION FOR CANDIDATES:

There are twenty questions on this paper. Answer all questions.

For each question there are four possible answers A, B, C and D.

Choose the one you consider correct and record your choice in soft pencil on the OTAS.

Read the instructions on the OTAS very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

The use of an approved scientific calculator is expected, where appropriate.

This question paper consists of **17** printed pages.

Setter: Mr Nigel Ng, Mr Timothy Ng

Vetter: Mrs Marie Huang

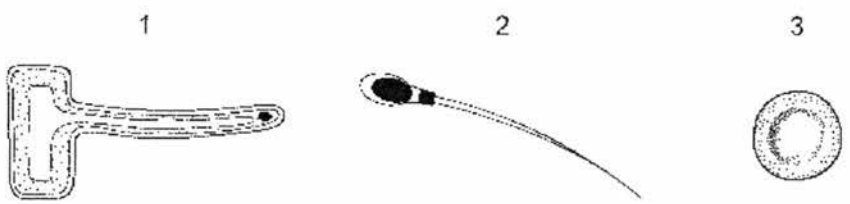
[Turn Over

(40 marks)
Answer ALL questions on the OTAS provided.

1 The nucleus of a unicellular organism was removed carefully in a laboratory. The cell survived and was observed carefully for a few days. Which of the following activities of the organism will cease due to the nucleus being removed?

A asexual reproduction
B egestion
C excretion
D locomotion

The diagram below shows three different cells, not drawn to scale. Use this information to answer questions **2** and **3**.



2 Which of the following is **not** found in cell **1**?

A Cell membrane
B Cell wall
C Chloroplast
D Nucleus

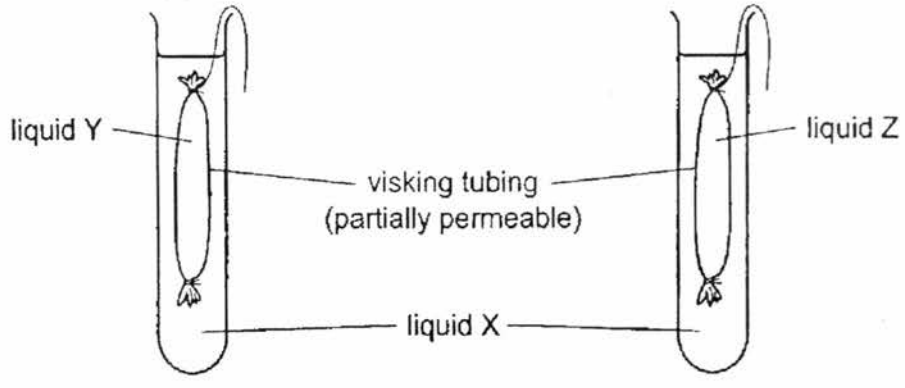
3 Which of the following is a common feature of all the three cells?

A They can undergo cell division.
B They carry out respiration.
C They contain genetic material.
D They grow in size.

4 Footballers often eat bananas during the break of a game. Which of the following correctly explains why this is so?

A Bananas are rich in fibre.
B Bananas are rich in glucose.
C Bananas are rich in maltose.
D Bananas are rich in starch.

5 In an experiment, the apparatus was set up as shown in the diagram.



After 30 minutes, the visking tubing containing liquid **Y** had collapsed while the tubing containing liquid **Z** was firm.

Which could be a correct description of the liquids at the **start** of the experiment?

	Liquid **X**	Liquid **Y**	Liquid **Z**
A	10% sucrose solution	25% sucrose solution	water
B	10% sucrose solution	water	25% sucrose solution
C	25% sucrose solution	10% sucrose solution	water
D	water	25% sucrose solution	10% sucrose solution

6 The table below shows the protein, fat and carbohydrate contents in 10 g of rice and fish.

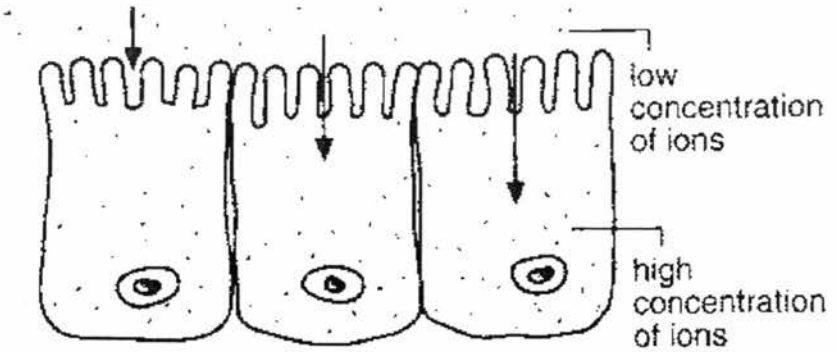
Food	**Protein/g**	**Fats/g**	**Carbohydrate/g**
Rice	0.6	0.1	8.7
Fish	1.6	0.005	0.0

The main end products of digestion of a meal of rice and white fish were extracted and food tests were conducted. Equal amounts of the extract were used for ethanol emulsion test, Benedict's test.

Which of the results in the table shows the correct observations of the food tests?

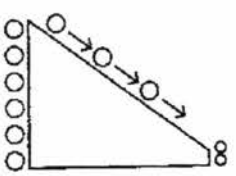
	Observations	
	Benedict's test	**Ethanol Emulsion Test**
A	Blue solution	White emulsion
B	Blue solution	Clear
C	Brick red precipitate	White emulsion
D	Brick red precipitate	Clear

7 The diagram below shows the uptake of ions in some animal cells.

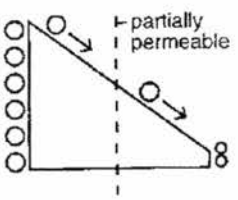


Which of the diagrams below can be used to show the processes taking place in the cells shown above?

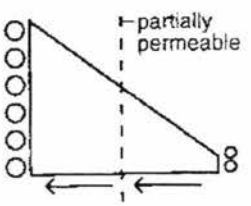
A



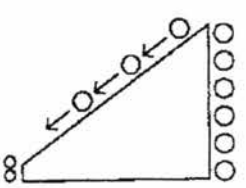
B



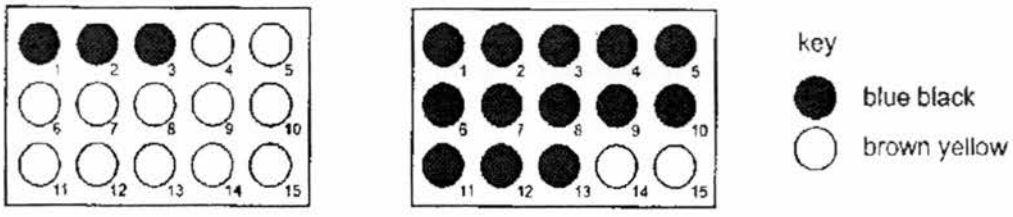
C



D



8 An experiment was carried out to investigate the digestion of starch using amylase at two different temperatures. A sample was removed from each mixture at 15 seconds intervals and placed into a spotting tile well containing two drops of iodine solution. The results are shown in the diagram.

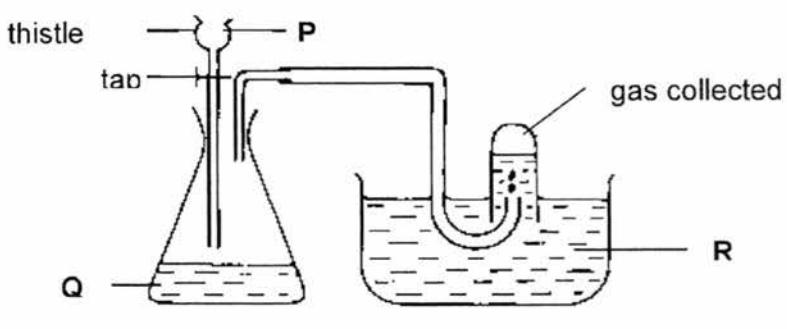


Which of the following shows the correct temperatures and times for the complete digestion of starch?

	Time for digestion of starch / s	
	10°C	**30°C**
A	0.45	13.45
B	3.15	0.45
C	45.00	195.00
D	195.00	45.00

9 The apparatus shown below is used to compare the activities of the enzyme catalase extracted from different tissues. The action of catalase is as follows:

$$2H_2O_2\ (l) \xrightarrow{\text{catalase}} 2H_20\ (l) + O_2\ (g)$$



What are **P**, **Q** and **R** at the beginning of the experiment?

	P	Q	R
A	catalase	H_2O	H_2O_2
B	catalase	H_2O_2	H_2O
C	H_2O	H_2O_2	catalase
D	H_2O_2	H_2O	catalase

10 Johnson carried out an experiment on some bread. He filled four test tubes with the following and incubated them at 37 °C for 24 hours.

Tube **W**: Salivary amylase + distilled water + a small piece of bread
Tube **X**: Salivary amylase + dilute HC*l* + a small piece of bread
Tube **Y**: Salivary amylase + dilute NaOH solution + a small piece of bread
Tube **Z**: Gastric juice + dilute HC*l* + a small piece of bread

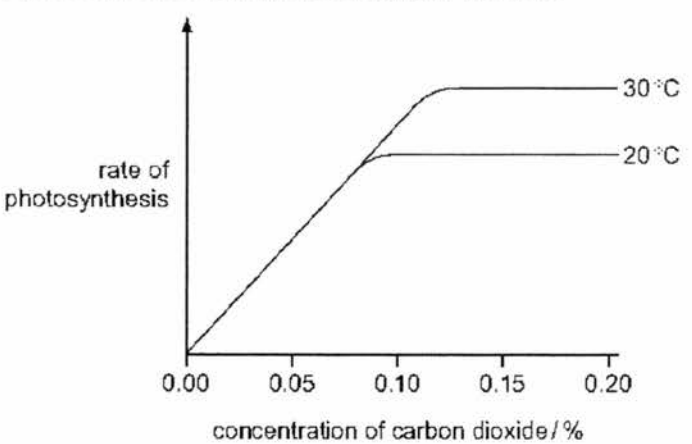
In which test tube(s) would you expect the bread to disappear after the incubation period?

A Tube **W**
B Tube **W** and **Y**
C Tube **X**
D Tube **X** and **Z**

11 Which chemical change takes place in green plants but **not** in animals?

A glucose → cellulose
B glucose → glycogen
C glycogen → cellulose
D glycogen → glucose

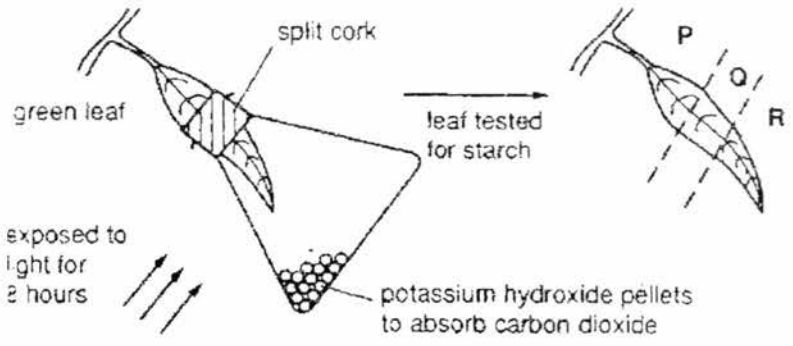
12 The graph shows the rate of photosynthesis in a plant in full sunlight at two different temperatures and different concentrations of carbon dioxide.



At normal atmospheric conditions, the carbon dioxide concentration is about 0.04%. Based on the graph above, which of the following statements about photosynthesis at normal atmospheric conditions is true?

A It is limited by carbon dioxide.
B It is limited by light.
C It is limited by temperature.
D It is not limited by any factors.

13 The diagram shows an experiment which was carried out to investigate photosynthesis.



What were the colours of regions **Q**, and **R**, after the leaf had been tested for starch using iodine solution?

	Q	*R*
A	blue/black	brown
B	brown	brown
C	blue/black	blue/black
D	brown	blue/black

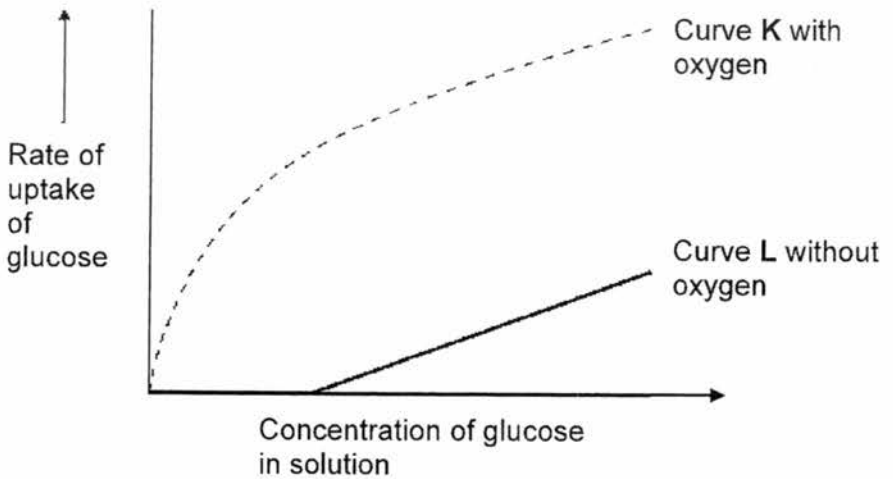
14 Which of the following organs does digestion **not** take place in?

A Colon
B Duodenum
C Mouth
D Stomach

15 Which of the following is **not** a function of the liver?

A Bile production
B Deamination
C Detoxification
D Red blood cell production

16 The graph below shows the effect of glucose concentration on the rate of uptake of glucose in a villus of an organism's small intestine

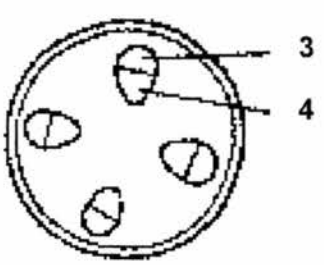


State the process used by the villus to absorb glucose in curves **K** and **L**.

	Curve **K**	Curve **L**
A	Active transport	Active transport
B	Active transport	Diffusion
C	Diffusion	Active transport
D	Diffusion	Diffusion

17 The diagram below shows the transverse section of the stem of a plant.

Stem



Name structure **3** and **4**.

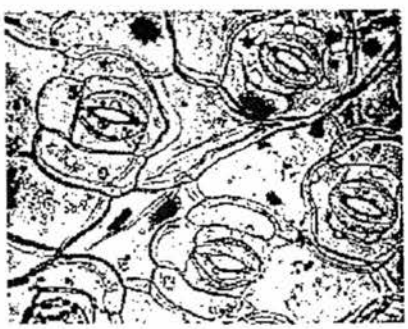
	Structure **3**	Structure **4**
A	Cambium	Phloem
B	Phloem	Cambium
C	Phloem	Xylem
D	Xylem	Phloem

18 Which row correctly shows the substances that can be located in the phloem of a green plant?

	glucose	sucrose	water and mineral salts
A	√	√	x
B	√	x	x
C	x	x	√
D	x	√	x

19 The photomicrograph below shows the same stomatal pore of a leaf under two different environmental conditions.

Condition **X**



Condition **Y**

I The atmosphere is dry.
II The presence of sunlight.
III The humidity is high.
IV The wind speed is strong.

Which of the above factor(s) could have caused the change in the stomatal pore size from condition **X** to condition **Y**?

A I only
B I and IV
C I, III and IV
D All of the above

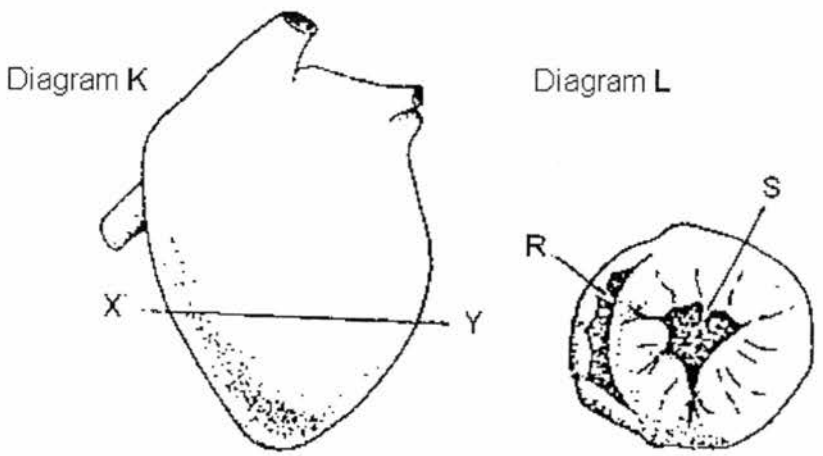
20 In a blood donation, why is blood collected from the vein instead of the artery?

A The vein has a bigger lumen for easier collection of blood.
B The vein has a lower blood pressure to ensure a safe draining of blood from the donor.
C The vein has deoxygenated blood to reduce the loss of oxygen from the donor.
D The vein has thinner walls for easier penetration of the needle.

21 Which of the following is true for a person with blood group AB?

A The blood plasma contains either natural antibody a or b.
B The blood plasma contains neither antibody a nor b.
C The red blood cells contain either antigen A or B.
D The red blood cells do not contain any antigen.

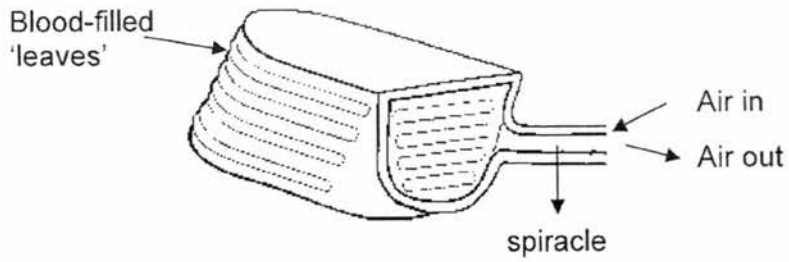
22 A mammalian heart, when cut along plane **XY** as in diagram **K** below produces a cut surface as shown in diagram **L**.



Blood filled regions are indicated by **R** and **S** respectively. Which of the following is **not** true?

A Blood in **R** would leave the heart via the pulmonary vein.
B Blood in **S** has come immediately from the left atrium.
C Blood in **S** would have a higher concentration of oxyhaemoglobin than the blood in **R**.
D Blood would flow from **S** into the aorta.

23 Scorpions have breathing organs called 'book lungs'. These consist of blood-rich tissues arranged like the leaves of a book. Air enters the 'book lungs' through a small opening called a spiracle. Gases can be exchanged between the air and the blood.



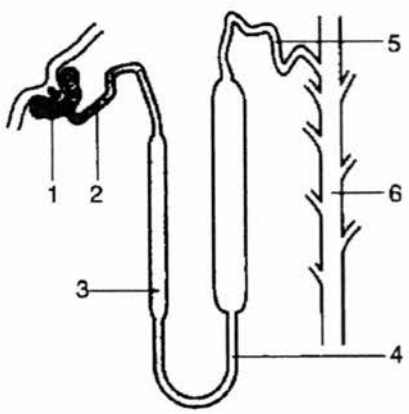
Which of the following will speed up gas exchange between the blood in the 'leaves' and the air around them?

A Increasing the flow of blood through the 'leaves'.
B Lowering the blood temperature.
C Reducing the number of 'leaves'.
D Reducing the size of the spiracle.

24 Which of the following is **not** found in cigarette smoke?

A Carbon dioxide
B Carbon monoxide
C Nicotine
D Tar

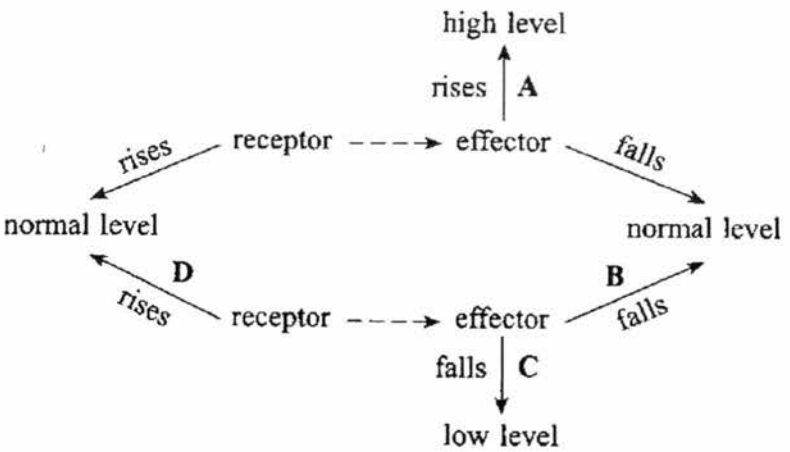
25 The diagram below shows a kidney nephrone.



In a normal person, which structures would contain the most amount of amino acids?

A **1** and **2**
B **3** and **4**
C **4** and **5**
D **5** and **6**

26 The diagram below summarises the homeostatic control of a substance present in the blood. Which arrow represents the result of negative feedback?

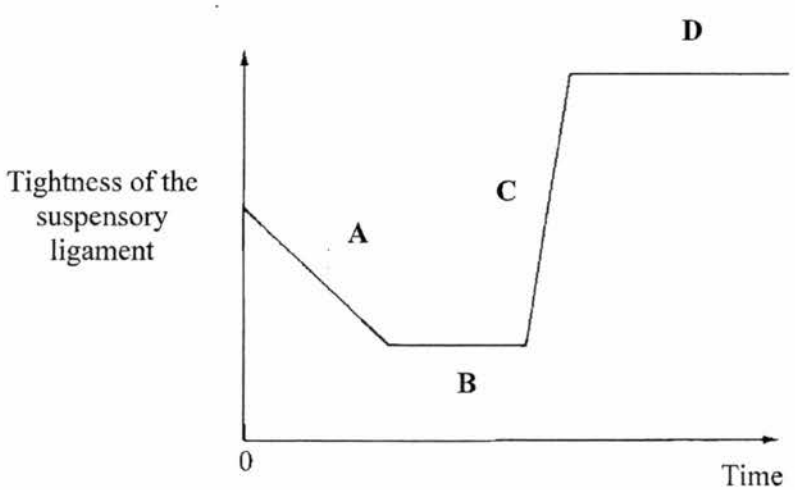


27 Which of the following is **not** possible in a reflex reaction?

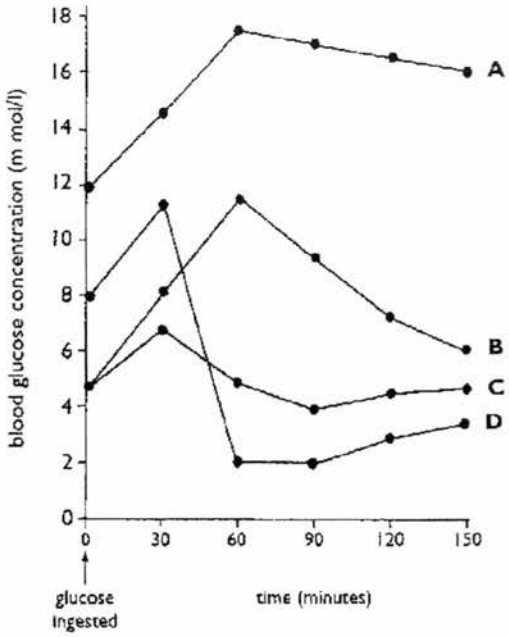
A Nerve impulses can be transmitted along the relay neurone to the brain.
B Nerve impulses can be transmitted directly from the sensory neurone to the motor neurone in the reflex arc.
C Nerve impulses can be transmitted directly to the brain via motor neurones.
D Nerve impulses can be transmitted from the brain to the sensory neurone.

28 The graph below shows the changes in the tightness of the suspensory ligaments in the eyes of a woman who looked at various objects over a period of time.

Which stage best represents the time when she saw a cat running away from her?

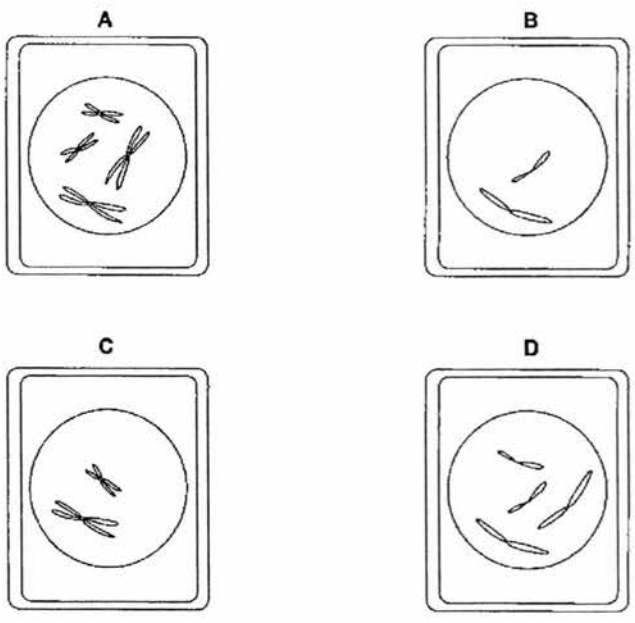


29 The following graph shows the blood glucose concentration in four individuals after the ingestion of glucose. Which of the glucose tolerance curves indicates a sufferer of diabetes?

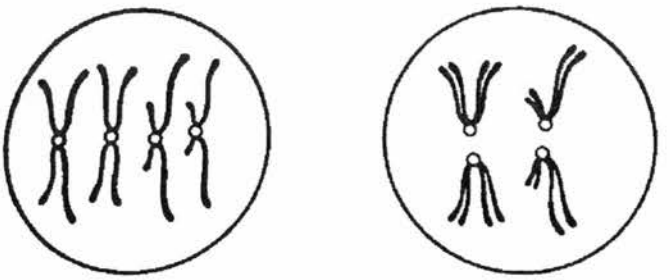


30 A diploid cell contains four chromosomes.

Which diagram shows the nucleus at prophase II of meiosis?



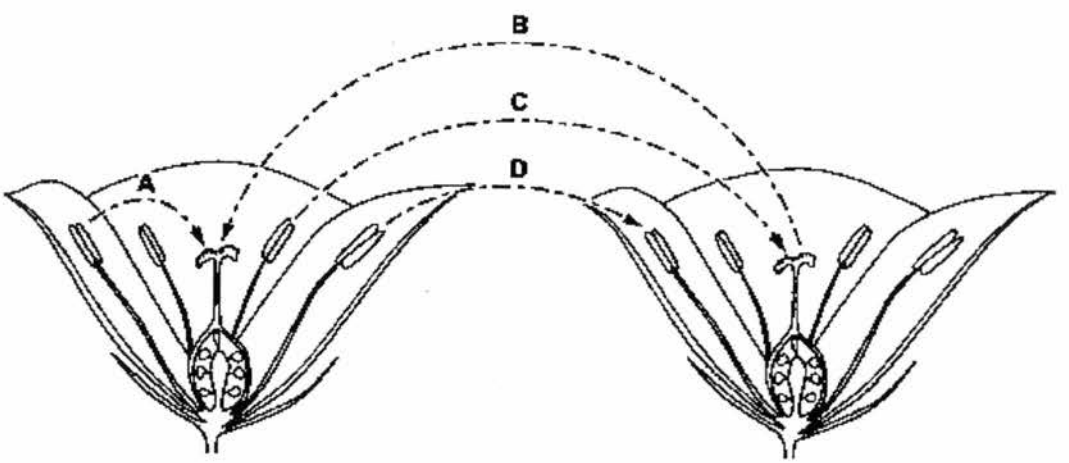
31 The diagram below shows two cells undergoing cell division.



Which of the following combinations about diagram **X** and **Y** is **wrong**?

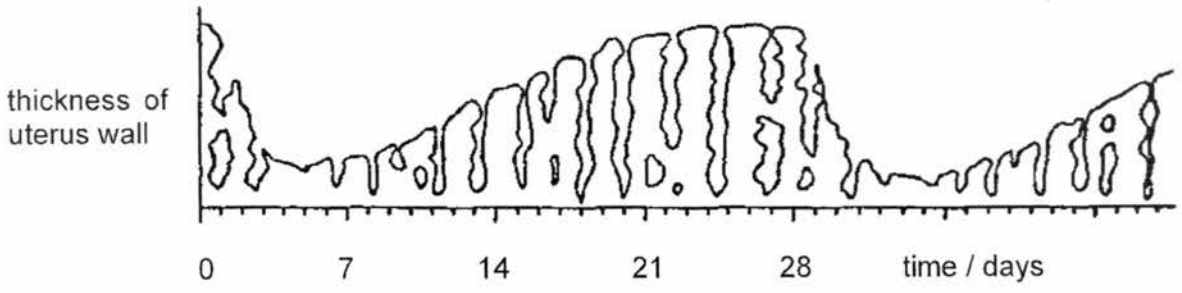
	Diagram **X**	Diagram **Y**
A	Cell divides once	Cell divides twice
B	Chromosomes replicate once	Chromosomes replicate twice
C	Chromosomes replicate twice	Chromosome number is reduced by half in daughter cells.
D	Chromosome number is reduced by half in daughter cells.	Genetic make-up of the daughter cells may be different from that of parent cell.

32 The diagram shows 2 flowers of the same species.



Which letter represents cross-pollination?

Refer to the diagram for questions **33** and **34**. The diagram shows the thickness of uterus lining at different times of the menstrual cycle.



33 What happens during day 14 to day 23?

A Concentration of progesterone is negligible.
B Progesterone decreases steadily.
C Progesterone increases steadily.
D Progesterone remains the same concentration.

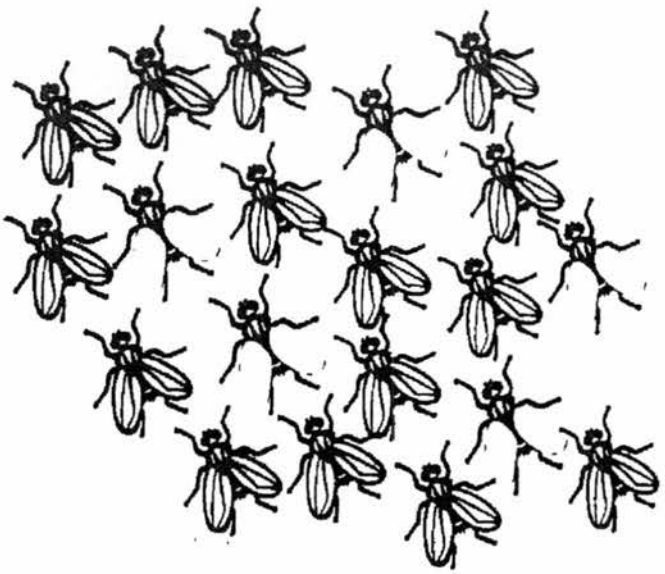
34 On which day(s) would implantation be more successful?

A Day 0
B Day 7 to day 14
C Day 14 to day 21
D Day 28

35 Identify the level of organization of the following structures, in **descending** order of size.

A cell, nucleus, chromosome, gene, base, nucleotide
B cell, nucleus, chromosome, gene, nucleotide, base
C chromosome, nucleus, gene, cell, nucleotide, base
D nucleotide, nucleus, base, chromosome, cell, gene

36 The drawing below shows fruit flies produced in a genetic experiment. The number of each type represents the ratio resulting from crossing two types of flies.



Assume that **F** represent the dominant allele and **f** represent the recessive allele involved in the cross.

Which of the following crosses would produce this ratio?

A FF x FF
B FF x ff
C Ff x Ff
D Ff x ff

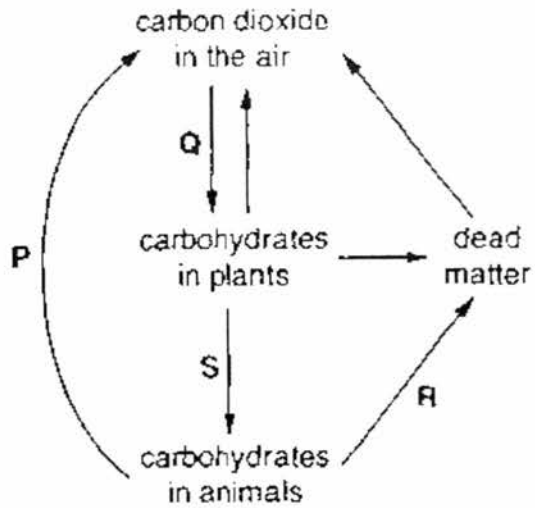
37 Which structure in a flowering plant has the same function as the testes of an animal?

A anther
B filament
C ovary
D pollen grain

38 Which of the following properties of modern insecticides would help to keep the environmental pollution by insecticides at the lowest level?

A Broken down by soil bacteria
B Consumed and accumulated in the bodies of predators
C Taken up and stored in plant roots
D Washed into the lakes and the rivers

39 The diagram shows the carbon cycle.



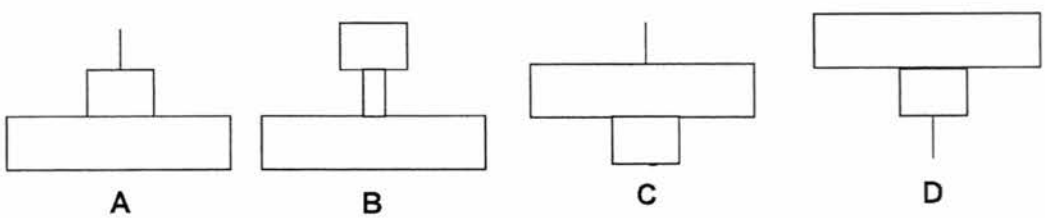
Which parts of the cycle form parts of food chains?

A P and Q
B P and S
C Q and R
D R and S

40 A food chain is shown below.

Fruit tree → Monkeys → Fleas

Which pyramid of numbers will represent this food chain?



End of Paper

Name | Reg. No | Class

MAYFLOWER SECONDARY SCHOOL MAYFLOWER SECONDARY SCHOOL MAYFLOWER SECONDARY SCHOOL MAYFLOWER SECONDARY SCHOOL MAYFLOWER SECONDARY SCHOOL

4EX

BIOLOGY (with SPA)

5158/02

Paper 2 Theory [80 Marks]

PRELIMINARY EXAMINATION TWO

August 2017

Additional Materials:
Approved calculator

1 hour 45 minutes

INSTRUCTIONS TO CANDIDATES

Do not start reading the questions until you are told to do so.

Write your name, class, and index number on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams, graphs or rough working.

Do not use paper clips, highlighters, glue or correction fluid.

This paper consists of **Section A** and **Section B**.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the Question Paper.

Section B

Answer **all** questions.

Write your answers in the spaces provided on the Question Paper.

Write an **E** (for Either) or an **O** (for Or) next to the number **8** in the grid on the right to indicate which question you have answered.

FOR EXAMINER'S USE		
Paper		**Marks**
Paper 1 (MCQ)		/ 40
Paper 2		
A		/ 50
B	**6**	/ 10
	7	/ 10
	8	/ 10
Total		**/ 120**

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

Candidates are reminded that **all** quantitative answers should include appropriate units.

Candidates are advised to show all their working in a clear and orderly manner.

The use of an approved scientific calculator is expected, where appropriate.

This question paper consists of **17** printed pages.

Setter: Mr Timothy Ng, Mr Nigel Ng

Vetter: Mrs Marie Huang

[Turn Over

Section A

Answer **all** questions in this section.
Write your answers in the spaces provided.

1 **Fig. 1a** below shows an experimental setup to investigate the growth of water plants.

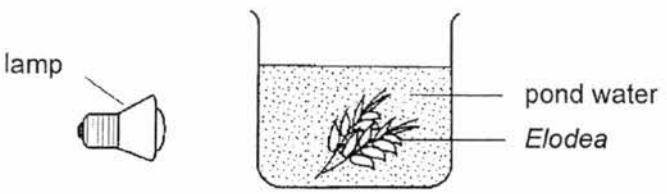


Fig. 1a

Equal masses of *Elodea* are placed into three separate beakers labelled A, B and C. All beakers are illuminated with different light intensities at different distances from the lamp. For beaker C, a coloured filter is placed over the lamp.

The plants are removed from the beaker, dried and weighed over the course of the 8-week experiment. The results are shown in the graph below.

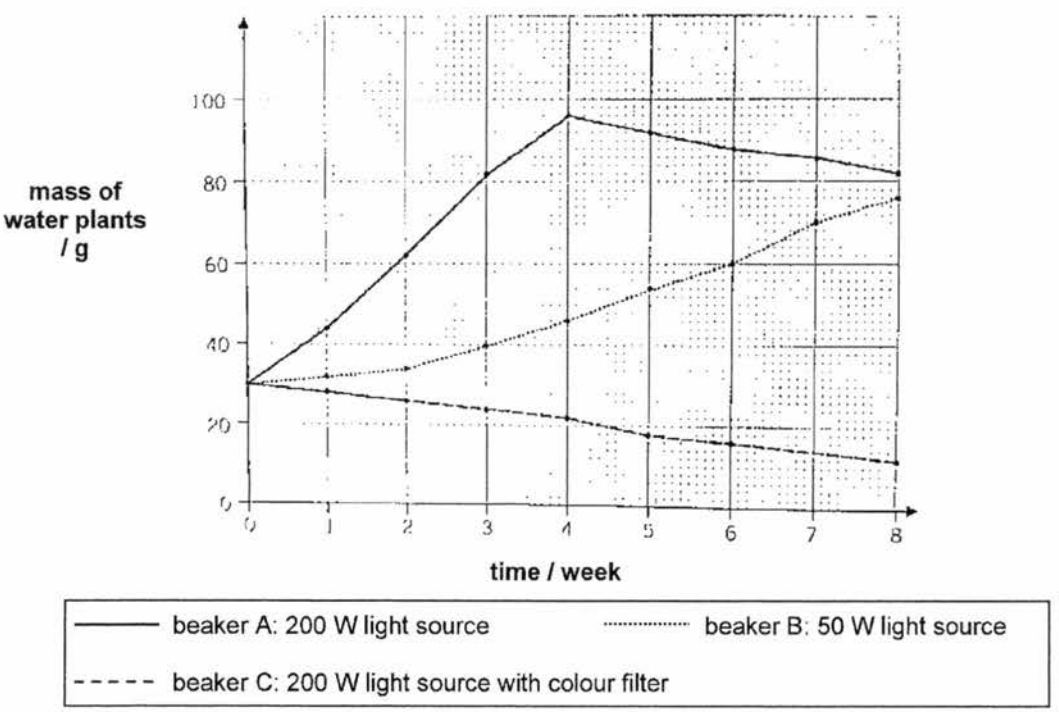


Fig. 1b

(a) With reference to **Fig. 1a**, identify **one** non-environmental controlled variable that should be kept constant throughout the experiment.

..... [1]

(b) Write down the chemical equation for photosynthesis.

..... [1]

(c) With reference to **Fig. 1b**,

(i) calculate the percentage increase in the mass of water plants in beaker A for the first month of the experiment.

[2]

(ii) explain how light intensity affects the rate of plant growth as observed in beaker A.

.....

.....

.....

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..... [3]

(iii) identify other factor(s) that could have affected the mass of the water plants in beaker C.

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..... [1]

(iv) explain why the mass of water plants begin to decrease after the first month in beaker A.

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..... [2]

[Total marks = 10]

2 **Fig. 2a** shows a potometer used to investigate the rate of transpiration in a leafy shoot.

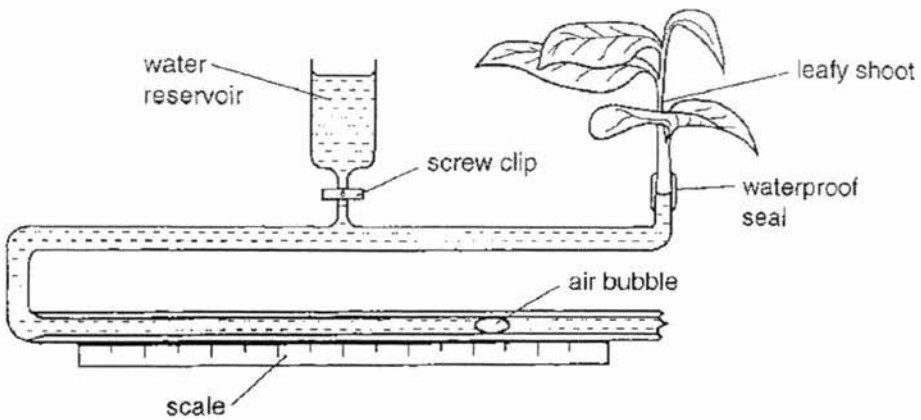

Fig. 2a

(a) Describe how the potometer is used to estimate the rate of transpiration in the leafy shoot.

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..... [2]

(b) Suggest the purpose of the waterproof seal.

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..... [1]

(c) Explain briefly how transpiration pull helps the leafy shoot to transport water from the stem to the leaves.

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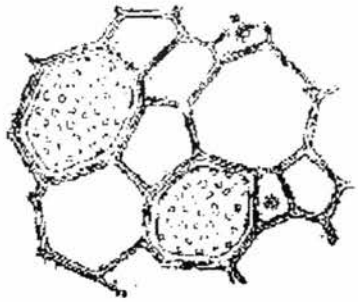
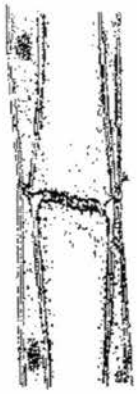
..... [4]

(d) **Fig. 2b** below shows a section of plant tissue removed from a green flowering plant as seen under the light microscope.



transverse section



longitudinal section

Fig. 2b

With reference to **Fig. 2b**,

(i) identify the plant tissue observed under the light microscope.

..... [1]

(iii) describe **two** features visible in the diagrams that support your answer in **(d)(i)**.

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..... [2]

[Total marks = 10]

3 **Fig. 3.1** below shows a cross section of the heart from a person suffering from a heart defect known as "hole in the heart".

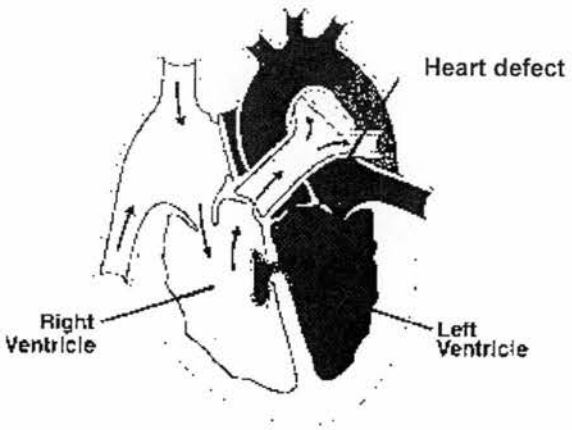

Fig. 3.1

(a) Describe how the heartbeats are generated in the heart.

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..... [4]

(b) Describe how the heart defect will affect the lifestyle of this person.

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..... [3]

(c) **Fig. 3.2** shows three blood vessels found in the human circulatory system.

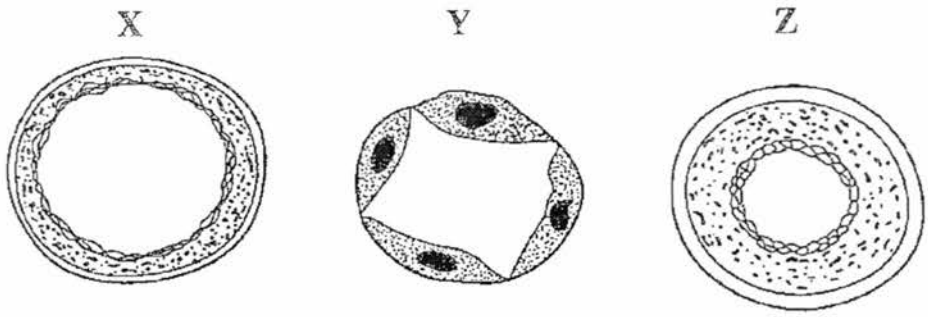

Fig. 3.2

(i) Identify blood vessel **Y** and state its function.

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..... [2]

(ii) State **one** major structural difference between blood vessel X and blood vessel Z. Explain the purpose of this adaptation.

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..... [2]

[Total marks = 11]

4 **Fig. 4** shows the reflex arc of a person who was pricked on the hand by a nail.

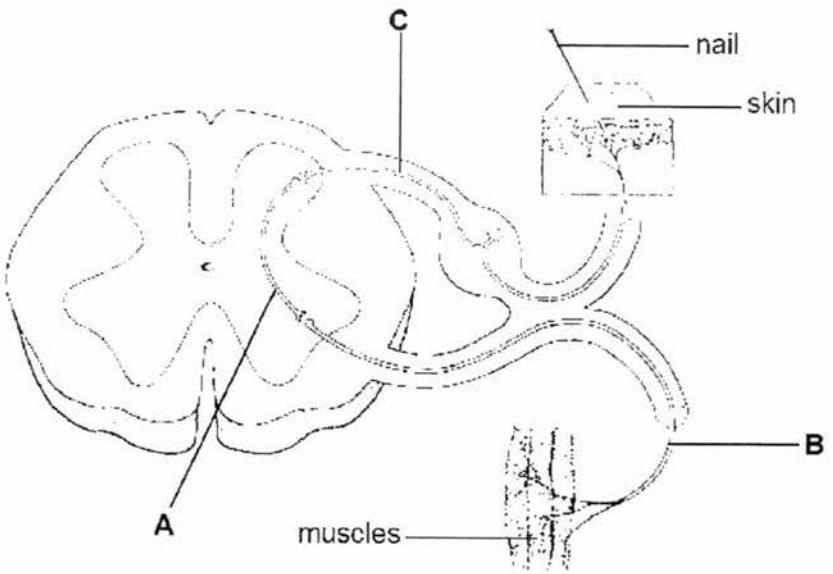

Fig. 4

(a) Describe how nervous coordination brings about a response to protect this person from serious harm after being pricked by the nail.

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..... [4]

(b) *Hormones* work together with the nervous system to control and coordinate the body activities. Define *hormones*.

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..... [2]

(c) Describe **three** differences between hormonal and nervous control.

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..... [3]

[Total marks = 9]

5 **Fig. 5.1** shows a cell undergoing different stages of mitosis.

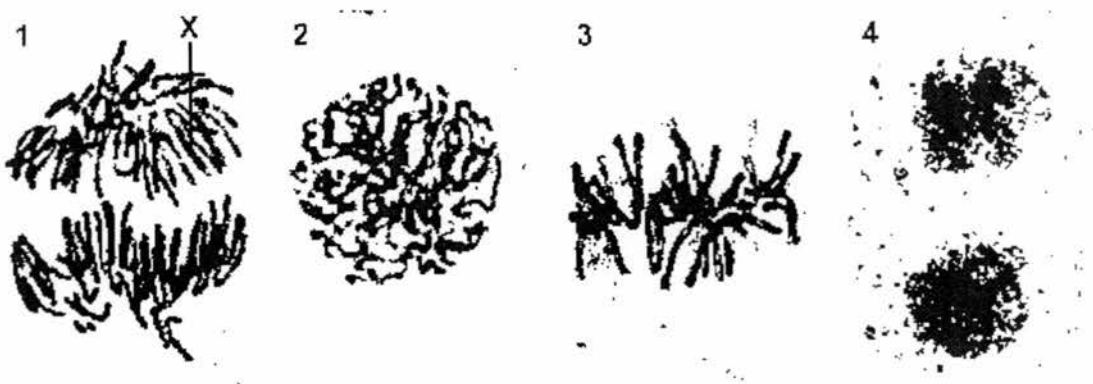

Fig. 5.1

(a) Identify the various stages of mitosis the cells in **Fig. 5.1** are undergoing.

Cell 1: .....

Cell 2: .....

Cell 3: .....

Cell 4: ..... [2]

(b) Describe the behaviour of chromosomes at metaphase I of meiosis.

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..... [1]

(c) How is genetic variation achieved during the process of meiosis?

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..... [2]

(d) Fig. 5.2 below shows a section of DNA.

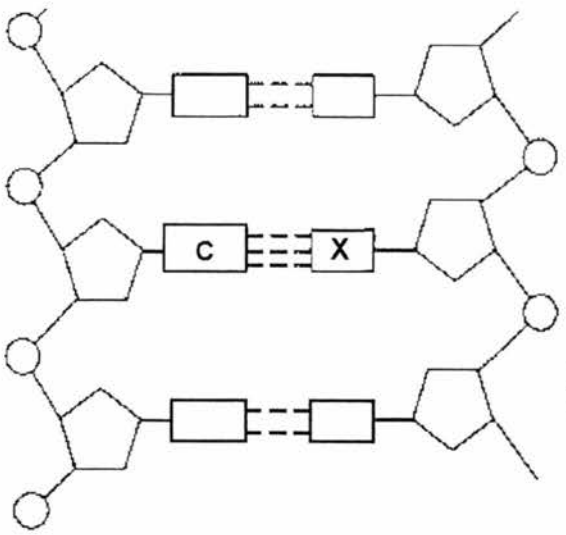

Fig. 5.2

(i) On **Fig. 5.2**, **circle** one nucleotide. [1]

(ii) Identify base **X**.

..... [1]

(iii) Explain briefly the relationship between DNA, genes and chromosomes.

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..... [3]

[Total marks = 10]

- - - - - End of Section A - - - - -

Section B

Answer **three** questions.

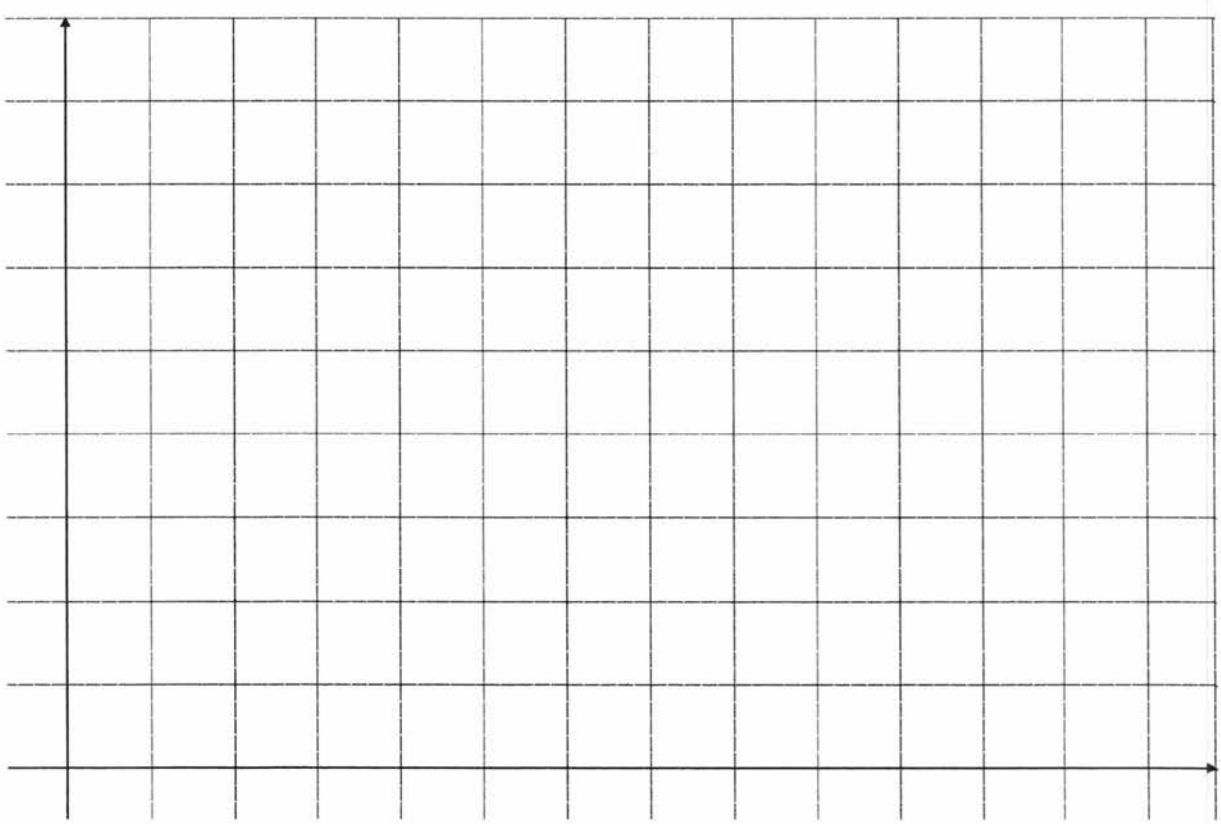
Question **8** is in the form of an **Either / Or** question. Only one part should be answered.

6 The blood glucose concentration of two people was measured over a 2.5-hour period after drinking a concentrated glucose solution. **Fig. 6** shows the results.

Time / hr	Blood Glucose Concentration / mg/dl	
	Person A	Person B
0.0	70	200
0.5	100	300
1.0	130	250
1.5	90	275
2.0	70	280
2.5	70	250

Fig. 6

(a) Plot a graph to show the relationship between the blood glucose concentration and time for both persons **A** and **B**. [3]



(b) Using information from the graph, describe how blood glucose concentration varies with time for both persons A and B.

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..... [3]

(c) Deduce which person is likely to be a healthy adult and give a reason for your answer.

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..... [1]

(d) One of the persons recently had a pancreatic operation which led to the results obtained. His doctor had also prescribed him with his monthly dosage of insulin for his diabetes. Explain how this treatment is effective for this person and suggest **one** other non-medical treatment for his illness.

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..... [3]

[Total marks = 10]

7 The diagram below shows part of the food web found in the Antarctic community.

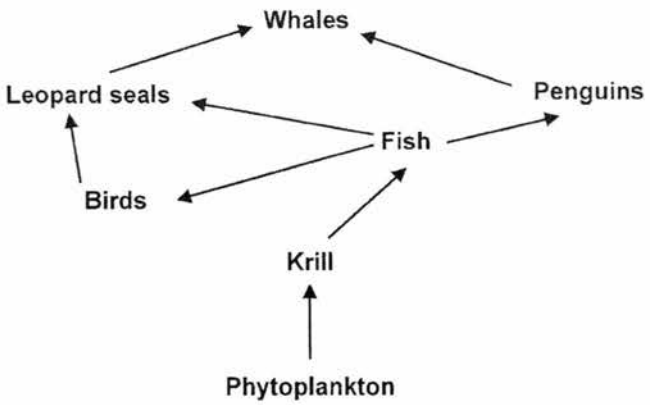

Fig. 7

(a) What is meant by the term community?

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..... [1]

(b) Construct a food chain which shows the whales receiving the least energy from their food.

[1]

(c) Draw a pyramid of biomass for a four-trophic level food chain consisting of penguins.

[2]

(d) With reference to **Fig. 7**, define the term *carbon sink* and describe the importance of our oceans as a *carbon sink* in our ecosystem.

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..... [3]

(e) Factories located along rivers sometimes illegally dump nitrogenous wastes into the nearby water bodies. What impact will this water pollution have on the marine habitat.

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..... [3]

[Total marks = 10]

8 **Either**

(a) Describe the differences between asexual reproduction and sexual reproduction in flowering plants.

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..... [4]

(b) Explain how an insect pollinated flower can be distinguished from a wind pollinated flower.

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..... [6]

[Total marks = 10]

8 Or

(a) Describe the effects of the hormones oestrogen and progesterone in the women's menstrual cycle.

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..... [6]

(b) Explain how the placenta supports foetal development during pregnancy.

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..... [4]

[Total marks = 10]

- - - - - End of Section B - - - - -

- - - - - End of Paper - - - - -

Answer Key (Prelim 2 2017 – 5158/01)

Paper 1: 40 MCQs [40 marks]

1.	A	11.	A	21.	B	31.	B/C
2.	C	12.	A	22.	A	32.	C
3.	B	13.	B	23.	A	33.	C
4.	B	14.	A	24.	A	34.	C
5.	B	15.	D	25.	A	35.	B
6.	D	16.	B	26.	B	36.	C
7.	C	17.	C	27.	C/D	37.	A
8.	D	18.	D	28.	C	38.	A
9.	B	19.	B	29.	A	39.	D
10.	A	20.	B	30.	C	40.	D

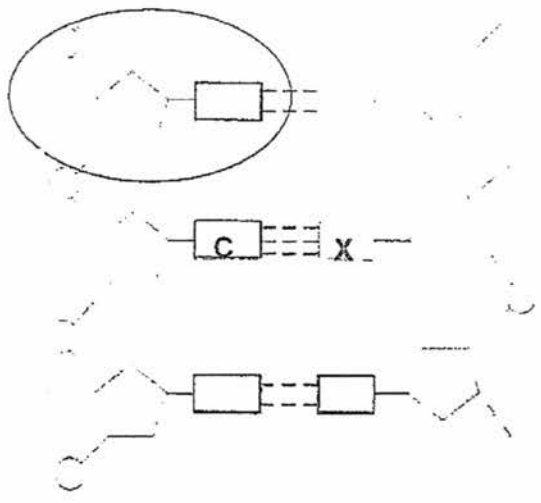
Answer Key (Prelim 2 2017 – 5158/02)

Paper 2 Section A: Answer all questions [50 marks]

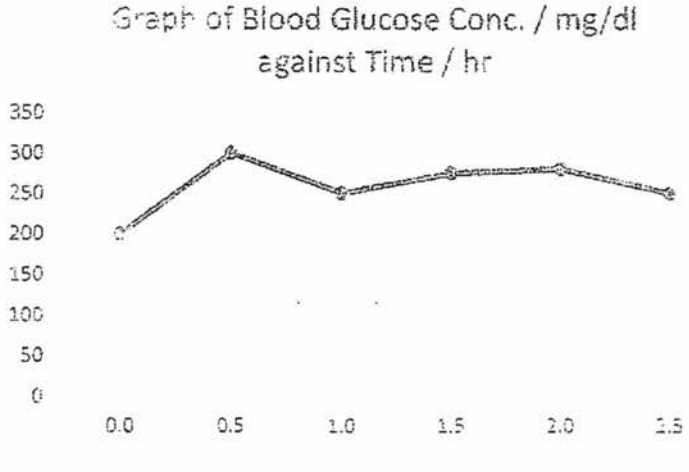
1	(a)	Type of lamp / type of water plant / mass of water plant (accept any logical answer)	[1m]
	(b)	Light $6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$ Chlorophyll **OR** Light $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ Chlorophyll No marks to be awarded if conditions (light & chlorophyll) are omitted.	[1m]
	(c)(i)	Increase in mass = 96 – 30 = 66 g Percentage increase in mass = 66 / 30 x 100% = 220%	[1m] [1m]
	(c)(ii)	• Light energy is absorbed by chlorophyll and converted to chemical energy. • The chemical energy produced is used to produce glucose during photosynthesis. • The glucose can be used to synthesise new plant parts resulting in an increase in mass of the water plants.	[3m]
	(c)(iii)	Concentration of carbon dioxide of the water / pH of water / availability of nutrients / minerals in the water Accept any logical answer	[1m]
	(c)(iv)	• Due to the optimal plant growth in the first month, there could be overcrowding of the water plants • resulting in competition for the limited resources in the beaker. As a result, some plants are unable to survive resulting in a decrease in mass.	[2m] **Total: 10**
2	(a)	• As the leafy shoot transpires, water from the tube will enter the xylem of the leafy shoot to replace the water loss. • The air bubble will move towards the shoot. The amount of water loss can be measured as the rate of transpiration.	[2m]
	(b)	The waterproof seal helps to prevent any water loss by evaporation which will affect the accuracy of the experiment.	[1m]

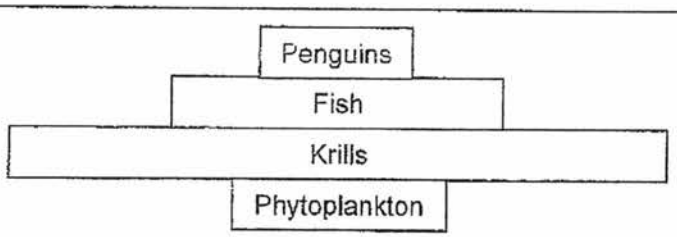
	(c)	◦ As there is a water vapour concentration gradient between the intercellular air space in the leaves and the surrounding air ◦ Water vapour will diffuse out of the leaves and ◦ the thin film of water lining the spongy mesophyll cells will evaporate to replace the water loss. ◦ The water potential gradient between the mesophyll cells and the xylem will cause water to enter the cells by osmosis. ◦ This creates a strong suction force that will pull water from the bottom of the stem to the leaves. (any 4)	[4m]
	(d)(i)	Phloem tissue	[1m]
	(d)(ii)	◦ Presence of sieve plates ◦ Presence of degenerate protoplasm ◦ Companion cells located next to sieve tube (any 2)	[2m] **Total: 10**
3	(a)	◦ The hole in the median septum will cause the oxygenated blood in the left side of the heart to mix with the deoxygenated blood in the right side of the heart. ◦ This will result in less oxygen transported around the body. ◦ Hence, he will be unable to participate in any strenuous activities.	[3m]
	(b)	Deoxygenated and oxygenated returns to the right and left atrium from the body and lungs respectively. ◦ During atrial systole, the higher pressure in the atriums will cause the atrio-ventricular valves to open forcing blood into the ventricles. ◦ During ventricular systole, the high pressure in the ventricles compared to the atrium and arteries causes the semi-lunar valves to open and the atrio-ventricular valves to close creating the "lub" sound. ◦ As the blood is pumped to the lungs and rest of the body, the higher pressure of the aorta and pulmonary artery will cause the semi-lunar valves to close to prevent backflow of blood. This will create the softer "dub" sound. (1m awarded for stating when the "lub" and "dub" sound is produced)	[1m] [1m] [1m] [1m]
	(c)(i)	Y – Capillary Facilitates the exchange of substances between blood and tissue cells.	[2m]
	(c)(ii)	◦ The walls of the Z (artery) is thicker and more muscular/elastic fibres than X (vein). ◦ This helps Z to withstand the high pressure of the oxygenated blood it transports. **OR**	[2m] **Total: 11**

		◦ There are valves present in X which is absent in Z. ◦ This is to help prevent backflow of the low pressure deoxygenated blood.	
4	(a)	◦ Receptors (nerve endings) in the skin detect the stimulus which is the nail pricking the skin. ◦ An electrical impulse is generated and sent from the sensory neurone ◦ to the relay neurone in the spinal cord which transmits the electrical impulse to the motor neurone. ◦ The motor neurone transmits the impulse to the effector (muscles in the hand contract) causing the person to withdraw the hand.	[4m]
	(b)	◦ Hormones are chemical substances produced in minute quantities by an endocrine gland. ◦ It is transported in the bloodstream to one or more target organs where it exerts its effect. It is eventually destroyed in the liver.	[2m]
	(c)	◦ Hormonal control involves hormones while nervous control involves nerve impulses. ◦ Hormones are transported by the blood while nerve impulses are transported by neurones. ◦ Hormonal response is usually slow while nervous response is usually quick. ◦ Hormonal response may be short-lived or long-lived while nervous response may be short-lived. ◦ Hormonal control is always involuntary while nervous control may be voluntary or involuntary. ◦ Hormonal control may affect more than on target organ whole nervous control is usually localised. (any 3)	[3m] **Total: 9**
5	(a)	Cell 1 – Anaphase Cell 2 – Prophase Cell 3 – Metaphase Cell 4 – Telophase (1m for every 2 correct)	[2m]
	(b)	Homologous chromosome will pair up and align along the equator of the cell.	[1m]
	(c)	◦ Crossing over at the chiasma between non-sister chromatids of homologous chromosomes at prophase I of meiosis ◦ Independent assortment of homologous chromosomes at metaphase I of meiosis	[2m]

	(d)(i)		[1m]
	(d)(ii)	Guanine	[1m]
	(d)(iii)	• DNA is made up of nucleotides that contain a 5 carbon (pentose) sugar, a phosphate group and a base. • A gene is made up of a specific sequence of nucleotides that code for a particular polypeptide. • A chromosome contains many genes / DNA organises into many chromosomes within the nucleus / Each molecule of DNA is a chromosome.	[3m] **Total: 10**

Paper 2 Section B: Answer all questions [30 marks]

7	(a)	 • Correct axis labels with units • Appropriate scale	[3m]

		◦ Plotting 2 graphs	
	(b)	• For person A, his blood glucose concentration peaks at 1hr at 130 mg/dl before decreasing back to a constant 70mg/dl. • For person B, blood glucose concentration is constantly higher than person A. • Person B's blood glucose concentration peaks at 0.5 hr at 300 mg/dl before fluctuating gradually decreasing to 250 mg/dl 2 hrs later.	[3m]
	(c)	Person A The level of glucose in his blood falls within the normal range.	[1m]
	(e)	• As the pancreas is damaged, it will be unable to produce <u>insulin</u> effectively. • The insulin injections will help convert the <u>excess glucose</u> in his blood to <u>glycogen</u>. • He should <u>exercise regularly</u> / <u>maintain a healthy diet low in sugar</u> to treat his illness.	[3m] **Total: 10**
8	(a)	A community refers to all organisms living and interacting with one another in a particular habitat.	[1m]
	(b)	Phytoplankton → Krills → Fish → Birds → Leopard seals → Whales	[1m]
	(c)	 1m for correct pyramid shape 1m for correct trophic levels with labels	[2m]
	(d)	• A carbon sink is an area that stores carbon compounds for an indefinite period of time. It stores more carbon than it releases. • Carbon dioxide that dissolves in the oceans are absorbed by phytoplankton during photosynthesis. • Some of the carbon compounds found in oceans is buried under the seabed as fossil fuels.	[3m]
	(e)	• The presence of nitrogenous wastes will encourage algal bloom / the rapid growth of algae. • This will prevent sunlight from reaching the water plants causing them to die and decompose lowering the oxygen levels in the water. • As more plants and fishes die due to the decreased oxygen levels,	[3m] **Total: 10**

		even more marine organisms will die resulting in a pool of death.	
9	Either (a)	Differences • Asexual reproduction does not involve the fusion of gametes while the fusion of gametes occurs in sexual reproduction. • Only one parent is need in asexual reproduction compared to two parents in sexual reproduction. • Offspring are genetically identical in asexual reproduction while they are genetically different in sexual reproduction. • Asexual reproduction is a quicker method of reproduction compared to sexual reproduction.	[4m]
	(b)	<table><tr><th>Feature</th><th>Insect pollinated</th><th>Wind pollinated</th></tr><tr><td>Petals</td><td>Large and brightly coloured</td><td>Small, dull coloured. May exist as inflorescence.</td></tr><tr><td>Nectar</td><td>Present</td><td>Absent</td></tr><tr><td>Scent</td><td>Fragrant and sweet-smelling flowers</td><td>Odourless flowers</td></tr><tr><td>Stigmas</td><td>Small, compact and do not protrude out of the flower</td><td>Large, feathery and usually protrudes out of the flower</td></tr><tr><td>Stamens</td><td>Non-pendulous and do not protrude out of the flower</td><td>Long and pendulous filaments and protruding anthers</td></tr><tr><td>Pollen</td><td>Fairly abundant. Large with rough surfaces.</td><td>More abundant. Tiny with smooth surfaces.</td></tr><tr><td>Nectar guides</td><td>Present</td><td>Absent</td></tr></table> (any 6)	[6m] **Total: 10**
9	Or (a)	• During the menstrual flow stage (day 1 to day 5), the levels of oestrogen and progesterone are very low. Menstruation occurs. • During the follicle stage (day 6 to day 13), the follicle cells begins to produce oestrogen which causes the repair and growth of the uterine lining. • During ovulation (day 14), a mature ovum is released on day 14 and the corpus luteum is formed. • During the corpus luteum stage (day 16 to day 28), the corpus luteum will secrete progesterone and some oestrogen. The progesterone maintains and further thickens the uterine lining.	[6m]

		building up more blood capillaries. • If no fertilisation occurs, the corpus luteum breaks down and the levels of oestrogen and progesterone decreases causing menstruation to occur again. • If fertilisation occurs, the corpus luteum will not degenerate and continue to produce both hormones until the placenta is fully developed and takes over.	
	(b)	• The placenta separates the maternal blood from the foetal blood to protect it from the high blood pressure. • The placenta prevents the mixing of the mother's blood and the foetus's blood as they may agglutinate if the blood groups are not compatible. • The maternal blood allows protective antibodies to diffuse from the mother's blood to the foetus's blood protecting it from certain diseases. • The placenta helps to remove metabolic waste from the foetus's blood by diffusion. • The placenta produces progesterone which maintains the uterine lining in a healthy state during pregnancy. (any 4)	[4m] **Total: 10**